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THE ECOLOGY OF THE SOUTHERN CALIFORNIA BIGHT: IMPLICATIONS FOR WATER QUALITY MANAGEMENT

Three-Year Report of the Southern California Coastal Water Research Project

SCCWRP

SOUTHERN CALIFORNIA COASTAL WATER RESEARCH PROJECT
A local government agency for marine ecological research

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4.3.2 Ocean Dumping

In an investigation of past ocean dumping practices, data on eight major types of wastes dumped from vessels into the Bight were reviewed. These were: (1) refinery wastes, (2) chemical wastes, (3) filter cake, (4) oil drilling wastes, (5) refuse and garbage, (6) radioactive wastes, (7) military explosives, and (8) miscellaneous types of wastes.

Figure 4-7 shows the location within the southern California Bight of both active and inactive ocean dumping sites. Fourteen ocean dumping sites, which were approved either by the U.S. Corps of Engineers or by the California Regional Water Quality Control Boards, have been designated for waste dumping purposes since 1931. At present, dumping of various types of wastes at nine designated sites is prohibited by regulatory agencies, and disposal of military explosives at two other sites is still under a moratorium issued by the Department of Navy in 1971.

Tonnage Dumped

Table 4-31 lists the major dumping sites, the total tonnage dumped during various periods and the estimated present annual dumping rate for each type of waste.

Refinery Wastes. It is estimated that approximately 480,000 M tons of petroleum refining wastes were dumped between 1946 and 1971, corresponding to an average of about 18,000 M tons/yr. However, the reported annual dumping rate

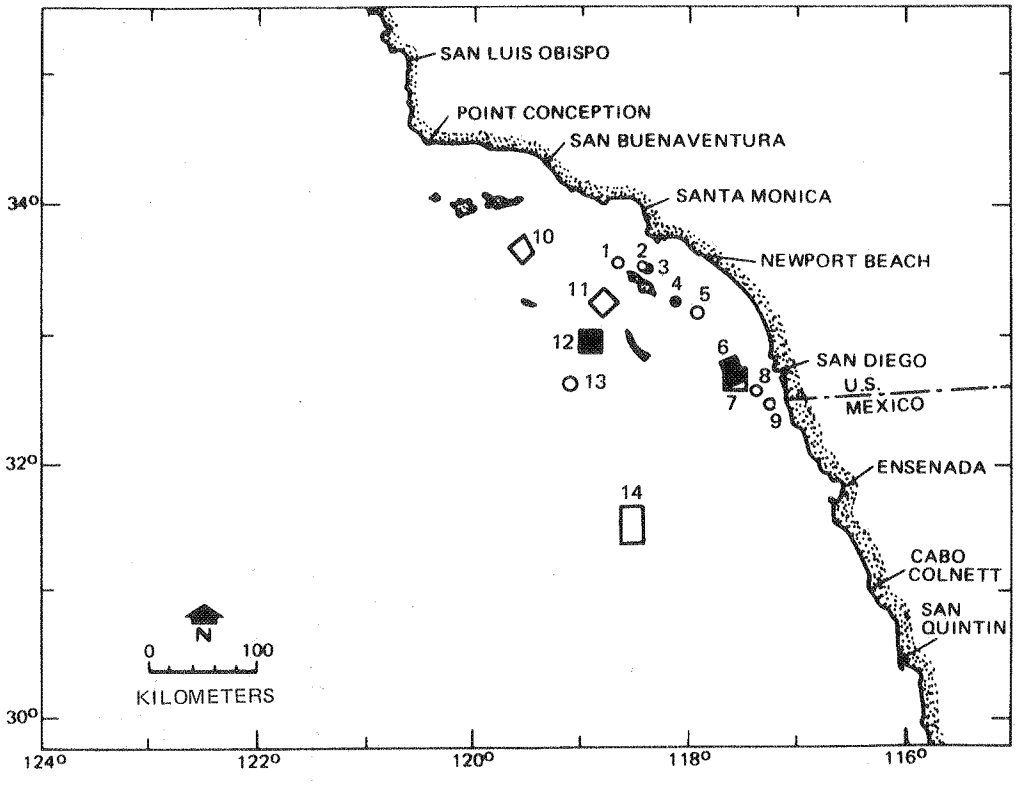

Figure 4-7. Designated Ocean Dumping Sites in the Southern California Bight (Shaded Sites are Active).

Table 4-31

SUMMARY OF WASTES DUMPED INTO THE SOUTHERN CALIFORNIA BIGHT, 1931-71

Type of Wastes	Major Dumping Sites*	Record Period	Estimated Total During Record Period (M tons)	Estimated Present Tonnage** (M tons/yr)
Refinery Wastes	3	1946-71	480,000	1,800
Chemical Wastes	2, 3	1965-71	2,800	470
	4	1947-71	5,700	210
	7	1960-67	140	-
Filter Cake	8	1969-70	320,000	-
Oil Drilling Wastes	2	1966-70	3,000,000	-
Refuse and Garbage	4	1931-71	47,000	1,200
	5	1944-70	7,400	-
	9	1947-68	90,000	-
Radioactive Wastes	10, 14	1946-68		-
Military Explosives	6, 11, 12	1945-70		-
Miscellaneous Wastes				250

*See Figure 4-7 for locations of dumping sites.
**Wastes for which no present tonnage estimate is given have been discontinued (military explosives by moratorium).

has dropped to about 1,800 M tons/yr since 1968. The principal dumping site for refinery waste is Site 3 (Figure 4-7) in the San Pedro Channel. Data on the specific composition of these refinery wastes are unavailable, however, they are believed to include spent caustic solutions, acid sludges, spent catalysts, petrochemical wastes, and chemical cleaning wastes. These materials surely must include phenols, trace metals, trace organics, and other potentially toxic substances, but quantitative information is not available.

Chemical Wastes. This type of industrial waste, which is dumped either in sealed containers or in bulk by tank barge, includes waste material from aerospace, heat-treating, plating, film processing, chemical processing, and electronic manufacturing firms and from industrial, medical, and academic laboratories, as well as from military and other sources. Most of the recorded bulk tonnage (210 M tons/yr since 1947) is discharged approximately 15 km east of Catalina Island (Site 4, Figure 4-7). Most of the containerized chemical wastes (470 M tons/yr since 1965) have been dumped at Sites 2 and 3 in San Pedro Channel. Between 1960 and 1967, approximately 140 M tons of chemical waste (sodium cyanide) were dumped in bulk 32 km west of Point Loma (Site 7). However, such dumping at Site 7 has been prohibited since 1967.

Filter Cake and Oil Drilling Wastes. Two types of relatively inert material, filter cake (70 percent fixed, 30 percent volatile solids) and oil drilling wastes (similar to dredging spoils) were dumped in the Bight in large amounts for a short period. Filter cake, consisting of about 50 percent perlite and 50 percent cellulose, is used in the extraction of algin from kelp, and approximately 320,000 tons were dumped about 15 km west of Point Loma (Site 8, Figure 4-7) during 1969 and 1970. More than 3 x 10^6 M tons of oil drilling mud and cuttings were dumped in the San Pedro Channel (Site 2) between 1966 and 1970. These two types of dumpings have been prohibited and discontinued since 1970.

Refuse and Garbage. Until recently, naval vessel refuse and garbage has been dumped into the Bight. Between 1947 and 1968, an estimated total of 90,000 M tons were dumped in the vicinity of the Coronado Islands (Site 9), and between 1944 and 1970 an estimated total of 7,400 M tons were dumped 40 km southeast of Catalina Island (Site 5). However, approximately 1,200M tons/yr of refuse and garbage from commercial vessels is still being dumped about 16 km east of Catalina Island (Site 4).

Other Types of Waste. Between 1945 and 1970, undetermined quantities of unspecified military explosives and toxic chemical ammunition have been dumped in several designated dumping sites in the Bight. Low-level radioactive wastes also have been dumped in the authorized locations between 1946 and 1968. Dumping of radioactive wastes has been terminated since its prohibition in 1968.

Based on information furnished by H-10 Water Taxi Company, Los Angeles, approximately 250 M tons/yr of undefined "miscellaneous wastes" are dumped in the Southern California Bight.

Trace Constituent Mass Emission Rates

Although there has been an attempt to quantify the distribution and amount of wastes in selected types dumped into the Bight, virtually nothing has been found in the public record regarding the concentration of specific pollutants

in the waste dumped. Thus, for pollutants such as trace metals and chlorinated hydrocarbons, estimation of mass emission rates from this source is very difficult. Nevertheless, order-of-magnitude estimates of the probable upper limits of such mass emission rates for selected trace metals and chlorinated hydrocarbons have been attempted. It appears that only refinery and chemical wastes and some undefined "miscellaneous" wastes constitute any significant source of trace pollutants to the Bight. As shown in Table 4-31, it is estimated that approximately 1,800 M tons/yr of refinery waste and 1,000 M tons/yr of chemical and miscellaneous wastes are being dumped into the Bight off Los Angeles and San Diego in 1971. It seems reasonable to assume that, on the average, these wastes would not contain more than 0.5 to 1 percent (by weight) of any one of the trace constituents being investigated by SCCWRP, with the exception of iron and zinc. It is likely that these wastes might contain more than 2 percent zinc and 10 percent iron. Owing to the value of mercury and silver, upper limits for their average concentrations are assumed to be an order-of-magnitude lower (0.05 percent). Based on these extremely rough assumptions, upper limit estimates of present annual trace constituent mass emission rates are presented in Table 4-32.

4.3.3 Aerial Fallout

Limited data are available on aerial fallout rates of trace constituents into the Bight. This source is difficult to quantitate for several reasons, including the high horizontal velocity compared to the vertical velocity of airborne particles, the diffuse nature of the source, the relatively high constituent gradients that may exist near the densely-populated areas, and the large area of the Bight.

Table 4-32
UPPER-LIMIT ESTIMATES OF TRACE CONSTITUENT MASS EMISSION RATES TO THE BIGHT FROM OCEAN DUMPING

Constituent	Maximum Concentration (% by Wt)	Est. Max. Mass Emission Rate* (M tons/yr)
Silver	0.05	1.5
Cadmium	0.5	14
Cobalt	0.5	14
Chromium	1	28
Copper	1	28
Mercury	0.05	1.5
Nickel	1	28
Lead	1	28
Zinc	2	56
Iron	10	280
Manganese	1	28
Total DDT	0.5	14
Total PCB	1	28

*Based on estimated 1971 dumping tonnage of 1,800 M tons/yr of refinery wastes and 1,000 M tons/yr of chemical and miscellaneous wastes.